REMARKS

This amendment is responsive to the office action dated Nov. 13, 2003.

By this amendment claims 1, 19, 37 and 29 have been amended to define the invention with greater particularity. Claim 18 was amended to correct the spelling of arsenide and other claims have been amended to cure other minor informalities.

Claims 8, 14, 17, 26, 32, 35 and 36 were rejected under 35 USC 112, paragraph 2 as being indefinite. With respect to claims 8 and 26 Examiner points out that applicant used the term "regrowth" in a context that departs from conventional industry usage and that the acceptable term is "epitaxial growth". By this amendment, the claims have been revised to incorporate Examiner's suggestion. Accordingly, claims 8 and 26 should be cured of any indefiniteness.

With respect to claims 14 and 32 Examiner indicates a lack of understanding of the recitation indicating that the laser diode modulator has a discrete channel spectrum of 1300-1600nm. Examiner questions the meaning of "discrete channel spectrum." Then questions as to whether that means the modulator only responds to those wavelengths. The term refers to a "slice" or range of the spectrum in which the modulator operates. Examiner's understanding is correct; the modulator responds only to wavelengths within the specified range. Further Examiner speculates that the modulator is intended to function simultaneously over the whole range of wavelengths, and questions whether that is possible. Applicant does not understand where Examiner received that idea, but surely not from the instant specification. Examiner's speculation is incorrect. The modulator is not intended to function simultaneously over the whole range of wavelengths available in the channel spectrum, only one at any one time. It is believed that the foregoing clarifies the terminology and that the two claims comply with 34 U.S.C. 112.

The recitation in claims 17 and 35 that the material is selected from the group consisting of In, Ga, Al, arsenide and phosphide is noted as being incorrect. The appropriate reference is to Gallium Arsenide and Indium phosphide as noted elsewhere

in the specification and in other claims, not arsenide and phosphide. Applicant has amended the appropriate locations in the specification and claims. Accordingly, claims 17 and 35 should now be definite.

Claims 1, 2, 4-8 and 11-40 were rejected under the doctrine of obviousness type double patenting as unpatentable over claims 1-20 of U.S. 6,353,264 assigned to the assignee of the present application, and notes that a timely filed terminal disclaimer may overcome that rejection. In that light, a terminal disclaimer signed by the undersigned attorney is submitted with this amendment. Both the patent and the application are owned by Northrop Grumman Corporation, formerly TRW Inc. An assignment made by TRW Inc over to Northrop Grumman Corporation is recorded at reel 01-3751 frame 0849 of the assignment recording records of the Patent Office. The disclaimer obviates the foregoing rejection.

Claims 3, 41 and 42 were rejected under the doctrine of obviousness type double patenting as unpatentable over claims 1-20 of U.S. 6,353,264, assigned to the assignee of the present application, in view of U.S. 5,568,574. As noted in the preceding paragraph, a terminal disclaimer was supplied with this amendment. That disclaimer should obviate the foregoing rejection without the necessity of debating the propounded combination of references.

Claims 1-5, 19, 20, 22, 23, 37 and 39-42 were rejected as unpatentable under 35 U.S.C. 103(a) over Zavracky et al. in view of Tanguay Jr, et al. This rejection is respectfully traversed. Of the foregoing claims, only claims 1, 19, 37 and 39 are in independent form.

With respect to claim 1, the rejection asserts that Zavracky et al shows a multilayer stack of wafers, which may be SOI, and shows that the wafer to wafer interconnect can be performed with LEDs, which assertedly provides a node and fiber optics, but concedes that Zavracky et al does not show how the fiber optics are coupled to the wafers; and asserts that the patent to Tanguay, Jr. et al shows that an optical waveguide can be used to interconnect multiple chips and that such optical waveguide

could be a rib. The rejection then concludes that it would have been obvious to use the Tanguay, Jr. et al structure in the Zavracky et al. device to provide a coupling means.

Zavracky does not show that wafer to wafer interconnect can be performed with LEDs and fiber optics. More accurately, applicant submits Zavracky speculates that such interconnection, which Zavracky presumes to exist, can be used as a substitute in his device, but Zavracky shows nothing of a fiber optic wafer-to-wafer interconnect. According to the undersign's Webster's collegiate dictionary, a definition of show, showing vt is 1: to cause or permit to be seen. Show n 1. a demonstrative display. One may ask, where is a demonstrative display of such interconnection in Zavracky et al?

Claim 1 (as amended) recites: "an optical data bus extending in a straight line through said optical transmission interface of each of said wafers in said stack of wafers normal to said first wafer surface, said optical data bus having first and second ends and being greater in length than the length of said stack with said first and second ends being positioned spaced respectively from said semiconductor layer of said initial wafer and from said second surface of said final wafer". Such structure is not shown or taught by any combination of Zavracky et al. and/or Tanguay, Jr. et al.

Claim 1 also recites: that the node is located adjacent to said optical transmission interface and a side of said optical data bus. Such structure is also not shown or taught by any combination of Zavracky et al. and/or Tanguay, Jr. et al.

Claim 1 still further recites a "means for optically coupling said plurality of integrated circuits of a respective wafer with said optical data bus through said side of said optical data bus without being physically attached thereto to provide optical data communication between said wafers and said at least one device and permit, when desired, axial withdrawal of said optical data bus from said optical transmission interface in each wafer of said stack of wafers to permit detachment of selected wafers from said stack of wafers ". It is clear that such structure is not shown or taught by any combination of Zavracky et al and Tanguay. The wafer layers are not taught to be detachable from one another or unconnected to the optical bus. In fact the separate wafers in Tanguay are epoxied together. Zavracky either does not commit or cannot do

so because Zavracky doesn't show or teach any particular structure, but only makes a general statement of an idea. the structure therefore is presumed permanent.

Applicant respectively submits that the proposed reconstruction of Zavracky with the teachings of Tanguay fails to present the combination set forth in claim 1. Applicant respectfully requests that the rejection of claim 1 be reconsidered and withdrawn.

With respect to claims 19 and 39 the only comment offered to applicant is that "*since the stack is an assembly it would be obvious to disassemble the stack for any reason, and it is well known in the art to replace defective devices/chips/wafers.*"

Presumably the foregoing is in addition to the reasons given in connection with the rejection of claim 1, but because claim 19 is an independent claim, applicant cannot be certain.

Even so applicant finds the foregoing reasoning confusing and to the extent understood insufficient. Although one may have a desire to replace a defective wafer from an assembly, those skilled in the art recognize that that is not always possible and is not the norm. The assembly cannot be disassembled without causing further damage, and the whole thing must be disgarded. Basically, an assembly can be disassembled only if it is designed to be disassembled for repair. Zavracky is mum on the subject.

The key to applicant's device is to remove a defective wafer from the stack without destroying or disabling any of the remaining wafers in the stack. Tanguay joins the multiple wafers or die together with epoxy. That's permanent. If one of the chips on a wafer in the multi-wafer assembly is bad then the whole wafer assembly must be junked and a new assembly obtained, unless chip redundancy is built into the chip design to cure the chip failure. Applicant submits that Zavracky similarly cannot have an individual wafer in his stack repaired and replaced without damaging the other wafers in the stack. No one skilled in the art would even think of attempting to do so in applicant's opinion. Thus neither Zavracky or Tanguay show or teach that the optical data bus is not physically connected to the wafers and can be freely withdrawn from the stack , removing an impediment to the removal of a wafer from the stack of wafers.

Claim 19 (as amended) recites: "said plurality of wafers being in parallel adjacent one another and aligned to define a straight stack of wafers, with said optical transmission interface of each of said plurality of wafers being aligned to define a straight path through said stack of wafers" and also recites "an optical data bus extending axially through said straight path and through each said optical transmission interface in said straight path normal to each said first wafer surface at each said wafer node. Such a structure is not shown or taught by any combination of Zavracky et al and Tanguay et al.

Claim 19 further recites that the combination includes a "means for coupling optical data between one said wafer node and other wafer nodes located on said wafers within the stack without being physically attached to any of said wafer nodes to permit said optical data bus to be axially withdrawn from said stack of wafers, when desired, enabling individual wafers to be selectively withdrawn from said stack." Such structural relationship is not shown or taught by Zavracky et al and/or Tanguay et al or any combination thereof. Applicant submits that the proposed reconstruction of Zavracky with the teachings of Tanguay fails to present the combination set forth in claim 19. For the foregoing reason, applicant respectfully requests that the rejection of claim 19 be reconsidered and withdrawn.

Claim 39 (as amended) recites a plurality of stacked wafers, that a semiconductor layer lies on one surface of each wafer and that a plurality of integrated circuits is formed on the semiconductor layer, that the plurality of integrated circuits includes a node formed on said semiconductor layer adjacent to an edge of said wafer, and contains means for coupling optical data into and out of said plurality of integrated circuits. The claim also recites a straight optical data bus extending axially in a straight path through each said wafer edge normal to each said first wafer surface at each said wafer node without being attached to said wafer edge, and that the optical data bus has means for coupling optical data between one said wafer node and other wafer nodes located on said wafers within the stack. The foregoing is not shown or taught in Zavracky or Tanguay. One may ask where is the straight optical data bus extending axially in a straight path in either Zavracky et al or in Tanguay? Where is the node

shown at the edge of the wafer? And where is it shown or taught that the optical data bus is unattached to the wafer edge?. And where is it shown or taught that there is coupling of optical data between the one wafer node and all the other wafer nodes?

Applicant submits that the proposed reconstruction of Zavracky with the teachings of Tanguay fails to present the combination set forth in claim 39. For the foregoing reason, applicant believes that claim 39 defines patentable subject matter. Applicant respectfully requests that the rejection of claim 39 be reconsidered and withdrawn.

Claim 37 (as amended) recites that the optical data bus extends in a straight line along an edge of said stack of wafers normal to said first surface of each wafer in said stack of wafers, and that the optical data bus has first and second ends and a side and being greater in length that the distance between the top of said semiconductor layer of said initial wafer and said second surface of said final wafer (e.g. is greater in length than the length of the stack; and that the plurality of couplers are longitudinally spaced apart along said optical data bus and that each of said couplers is for translating incident optical energy propagating thereto in a direction normal to said optical data bus to optical energy propagating in opposite directions along the axis of said optical data bus and for translating the direction of propagation of a portion of optical energy propagating along said axis of said optical data bus incident thereon to optical energy propagating in a direction normal to said axis out a side of said optical data bus. Such structure is not shown or taught by Zavracky et al., that structure is not shown or taught by Tanguay et al., and therefore that structure cannot possibly be shown or taught by any combination of the two patents as the Patent Office asserts in the rejection. For the foregoing reason, applicant believes that claim 37 defines patentable subject matter. Applicant respectfully requests that the rejection of claim 37 be reconsidered and withdrawn.

With the benefit of hindsight the applicant's invention may appear simple. Even so, hindsight cannot be used to piece together a combination from the prior art. According to the Federal Circuit to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in

the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations, *In re Vaeck*, 20 USPQ2d 1438 (Fed. Cir. 1991) and Manual of Patent Examining Procedure, Section 2143 (emphasis added). As discussed, this last requirement is clearly lacking. Whatever combination Examiner has put together is not the combination set forth in any of claims 1, 19, 37 and 39. For that reason alone, the Examiner has not made a *prima facie* case of obviousness.

In *In re Fritch, 23 USPQ 2d 1780, 1783 (Fed. Cir. 1992)* the court reaffirmed that *Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined only if there is some suggestion or incentive to do so* (citing *ACS Hosp. Systems, Inc. v. Montefiore Hosp*, 221 USPQ 929, 933 (Fed. Cir. 1984). *Although couched in terms of combining teaching found in the prior art, the same inquiry must be carried out in the context of a purported obvious "modification" of the prior art. The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification* (citing *In re Gordon* 221 USPQ 1125, 1127 (Fed. Cir. 1984)).

It is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious (citing *In re Gorman*, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991). This court previously stated that "*one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention*" (citing *In re Fine*, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988)).

Claims 2-8, 11-18, 41 and 42 depend, directly or indirectly, on claim 1, define that invention with greater particularity and include all of the limitations presented in claim 1. Applicant refers to the discussion of the rejection of claim 1 presented in the

preceding paragraphs, which is incorporated herein by reference. For that reason, applicant believes the claims define patentable subject matter.

Claims 20-34 depend, directly or indirectly, on claim 19 define that invention with greater particularity and include all of the limitations presented in claim 19. Applicant refers to the discussion of the rejection of claim 19 presented in the preceding paragraphs, which is incorporated herein by reference. For that reason, applicant believes the claims define patentable subject matter.

Applicant also notes that dependent claim 21 was rejected as unpatentable over Zavracky et in view of Tanguay et al. and further in view of Fitch et al reasoning that it is obvious to use the SOS shown in Fitch instead of the specific structure shown by Zavracky et al as a design alternative. To the extent understood, applicant respectfully disagrees. The transistors in Fitch are not truly "stacked" in the same context used by the applicant, that is, individually fabricated and then placed one atop the other. In Fitch the separate transistors are fabricated directly together, one being built atop the other, as example, to produce a unitary integral structure. Secondly, all that the cited selection of Fitch describes is a wide mix of different materials that may be used to form the substrate of the device that Fitch describes in his specification. Despite the foregoing deficiencies, Fitch does not provide the missing elements described in claim 1.
The patent to Jandel was noted in connection with the rejection of claim 24, and the addition of the patent to Lee in connection with the rejection of claim 28, and the alternative application of Nanishi et al in connection with the rejection of claims 26 and 27. Applicant believes any detailed discussion of these references and the compound rejection of the dependent claims is unnecessary in view of the failure of the prior art to teach or show the combination set forth in claim 19, from which the foregoing claims directly or indirectly depend.

Claim 38 depends from claim 37, defines that invention with greater particularity, and includes all the limitations in claim 37. Applicant refers to the discussion of the rejection of claim 37 presented in the preceding paragraphs, which is incorporated

herein by reference. For that reason, applicant believes claim 38 defines patentable subject matter.

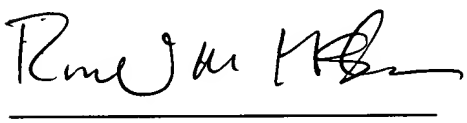
Claim 40 depends from claim 39, defines that invention with greater particularity, and includes all the limitations in claim 39. Applicant refers to the discussion of the rejection of claim 39 presented in the preceding paragraphs, which is incorporated herein by reference. For that reason, applicant submits that claim 39 defines patentable subject matter.

It is believed that the foregoing amendment places the application in condition for allowance. An early notice of allowability is respectfully requested.

CLAIM SUMMARY

Claims 1-40 were originally in the application as filed. Claims 9, 10, 35 and 36 were canceled and claims 41 and 42 added, leaving claims 1-8, 11-34, and 37-42 remaining for examination.

Respectfully submitted,



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Enc. Terminal disclaimer

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